

SPECIALTY CROP BLOCK GRANT AWARDS 2018

In 2018, the Washington State Department of Agriculture received approximately \$4.6 million to help fund 25 projects:

Grant Recipient: WSU – Lisa DeVetter

Project Title: Promoting Productivity and On-Farm Efficiencies with Plastic Mulches in Raspberry

Award: \$249,569

Abstract: Red raspberry (*Rubus idaeus*) growers are increasingly using tissue culture (TC) transplants for planting. However, weed management and establishment of TC transplants is challenging. Growers need new techniques to promote TC establishment and ensure the long-term productivity of their fields.

Biodegradable plastic and non-degradable polyethylene mulches (BDMs and PE, respectively) are promising tools that promote crop growth and establishment while managing weeds. These mulches have not been widely studied in perennial systems, including raspberry. Since 2017, scientists and extension specialists at Washington State University and USDA have been studying the application of plastic mulches in raspberry planted as TC transplants and have found promising results. The goal of this project is to continue and expand our evaluations so that we may develop knowledge and practical strategies to promote establishment of raspberry planted as TC transplants. To accomplish this, we will study how plastic mulches (BDMs and PE) impact raspberry plant growth, yield, and fruit quality, as well as impacts on weed management and root lesion nematode populations in on-farm collaborative experiments. Surface and in-soil degradation of BDMs will also be assessed. We will also explore techniques to promote surface degradation of BDMs to fit the variety of raspberry production systems in Washington. Barriers to plastic mulch adoption will be assessed through on-farm trials, surveys, and focus groups. Information from our field trials and adoption studies will be incorporated into our robust outreach plan to ensure timely dissemination of project information.

Grant Recipient: WSU – Steven Seefeldt

Project Title: Plant Biology and the Control of Annual Polygonum Species

Award: \$137,128

Abstract: This project will be led by Washington State University. Four annual polygonum species, wild buckwheat, prostrate knotweed, pale smartweed, and ladythumb smartweed (*Polygonum convolvulus*, *aviculare*, *lapathifolium*, and *persicaria*, respectively) are becoming more problematic in northwest Washington specialty crops. As these plants are all related, chemical control methods are similarly problematic. Fortunately, there are important differences in the biology of these plants that impart potential weakness that can be targeted in carefully designed integrated pest management strategies to achieve improved control.

The outcome of this proposal is to develop effective, biologically-based strategies to control annual polygonum species in blueberries, potatoes, and cucurbit crops. The objectives to achieve this outcome are to: 1. Determine growing degree days needed for these species to begin producing viable seed; 2. Compare the effectiveness of tillage with and without pre- and post- emergence herbicides; and 3. Measure the rate of spread of these plant species based on tillage and other control practices.

Tasks to be completed: In greenhouse and growth chambers, determine growing degree days for the 4 polygonum species. In cooperator fields growing either blueberries, potatoes, or cucurbits, conduct three years of field trials. Organize field days and participate in grower meetings to present results of research.

Grant Recipient: WSU – Hanu Pappu

Project Title: Integrated Management Strategies for Thrips Iris Yellow Spot Virus Threat to Onion

Award: \$216,351

Abstract: If awarded a grant, Washington State University will establish an agreement. The proposed research will contribute to the development of eco-friendly thrips management practices and disease resistant onion cultivars thereby reducing the inputs, including insecticides for vector control, and cost of production with a subsequent increase in profit, and will directly contribute to environmental stewardship and increased sustainability. Washington is the 2nd biggest producer of onions in the country, and diseases are a major production constraint affecting both yield and quality of seed as well as bulb crops. Iris yellow spot virus (IYSV), transmitted by onion thrips, has been a major production constraint in WA and the neighboring states of ID and OR. Virus infection results in severe necrosis of ‘scapes’ (=flower-bearing stalks) leading to lodging of scapes and making harvesting of seed difficult. Several fields experienced total crop loss over the years. Overall, yield losses due to these diseases vary from 10 to 70%. The virus is exclusively transmitted by thrips (there is no evidence of seed transmission). The most effective means to manage an insect-transmitted virus such as thrips-transmitted IYSV is to develop and deploy a combination of tactics – the central ones being sound thrips management combined with growing virus resistant cultivars. We will use a two-pronged approach – target the thrips vectors by developing eco-friendly and sound thrips management regime and to develop virus resistant cultivars by enhanced screening of breeding lines that were previously found to have less virus accumulation under heavy virus pressure.

Grant Recipient: WSU – Lav Khot

Project Title: Alternative pest management technologies for tree fruit and wine grapes

Award: \$249,088

Abstract: This WSU team, with agricultural engineering, viticulture, plant pathology and entomology expertise, will investigate use of horticultural oil thermotherapy (HOT) and ozonated water sprayer (OWS) applications for effective control of indicator pest and disease species in pear and wine grapes. Both are novel ways to transform commonly-accepted low-risk materials (oil, ozonated water) for improved pest and disease control with minimal chemical residue levels needed for export market. Our project aligns with environmental stewardship goals of using methodologies and products that have minimal off-target impacts and reduced chemical inputs. It bolsters available toolkit for organic pest management, while being equally viable in conventional and IPM-based programs. Our specific project objectives are: (1) to transform our existing laboratory-scale HOT sprayer into a field-appropriate prototype and optimization for pear psyllid, and grape mealybug and powdery mildew control; (2) to evaluate a commercially available OWS to control the above indicator pest and disease species; and (3) to engage local manufacturers to build and distribute these technologies as well as conduct extensive Extension to increase the rate of technology adoption. Objective 1 activities include: (i) HOT sprayer prototyping, (ii) evaluate its application accuracy within different canopy regions of trellised grape and large pear canopies, and (iii) assess control of indicator pest and disease species through field trials. Objective 2 activities include: (i) optimization of OWS, and (ii) bioassay-based mortality assessments with field evaluations. Objective 3 activities will focus on early engagement with growers and equipment manufacturers for meaningful outreach education of field optimized technologies.

Grant Recipient: USDA-ARS – Rodney Cooper

Project Title: Gut Content Analysis to Pinpoint the Weed Sources of Potato Psyllid

Award: \$215,538

Abstract: A major challenge in controlling zebra chip disease of potatoes is our inability to predict what potato fields are likely to be colonized by potato psyllid, the vector of the pathogen that causes zebra chip. Adding to this challenge is substantial variability in psyllid pressure among years; populations can range from a few hundred to tens of thousands of psyllids captured annually in traps across the region.

Circumstantial evidence from recent research suggests that matrimony vine (*Lycium barbarum*) is a primary weed source of potato psyllids entering potato fields of the Pacific Northwest, but direct evidence for this association is lacking and the role of other perennial weed hosts as sources of psyllids is still uncertain. A primary goal of our project is to use molecular gut content analysis to directly pinpoint what plants (e.g. matrimony vine) potato psyllids are dispersing from as they enter potato fields in early summer. A second goal is to determine if early-season monitoring of potato psyllid in matrimony vine or other perennial host species identified in this project as sources of psyllids can be used to predict psyllid pressure expected in potato in late summer. The capability to predict psyllid populations and risk based on populations on spring hosts would allow growers to more effectively tailor management decisions.

This project will be led by researchers at the USDA-ARS in Wapato, WA, and includes researchers from Washington State University, Oregon State University, and University of Idaho.

Grant Recipient: USDA-ARS – Lisa Neven

Project Title: Establishing risk of invasive insect pests of tree fruits in green yard waste from Canada

Award: \$243,449

Abstract: The USDA-ARS Temperate Tree Fruit and Vegetable Research Unit in Wapato, WA will establish an agreement with WA State Department of Agriculture focusing on protecting specialty tree fruit crops from invasive insect pests associated with solid waste from British Columbia (BC), Canada, transported to landfills in WA. Green yard waste is the most likely component of the waste stream to contain invasive pests of tree fruits. The introduction of an invasive pest into the tree fruit production areas of WA will greatly reduce the profitability of the growers as a result of establishment of quarantines to prevent further expansion of the pest, implementation of additional field and postharvest control measures, and revocation of several export and interstate transport agreements due to the existence of the pest. Objectives of the study are to (1) identify invasive insect pests of tree fruits potentially found in BC solid waste, (2) quantify the risk of introduction of potential invasive insect pests of tree fruits from BC to WA through the solid waste transportation pathway, (3) assess the establishment risk of potential invasive insect pests from BC to WA fruit-growing regions, and (4) compare and match the climatic conditions of solid waste source sites with that of waste processing and receiving sites in WA near tree fruit production areas. General tasks of personnel cooperating on and hired on the project will be to collect green yard waste samples from BC throughout the year, extract the eDNA containing insects and other living organisms from the samples, identify the insects found, and to develop models for risk of establishment of the insects in the tree fruit production areas of WA. The major anticipated outcome of the project is the enhancement of the competitiveness of specialty tree fruit crops through management of green yard waste movement originating from BC to protect the tree fruit industry in WA, and potentially the banning of green yard waste movement into major fruit-growing regions.

Grant Recipient: WSU – Walter S. Sheppard

Project Title: Ensuring the Sustainability of Pollination Services to WA Specialty Crops

Award: \$249,751

Abstract: Honey bees provide vital pollination services for numerous specialty crops in Washington including tree fruits, berries, and vegetable and horticultural seeds. Declines in honey bee health in recent decades have been caused in large part by two intractable pest issues, Varroa mites and a wave of new bee infecting viruses. In order to safeguard a reliable and economically viable pollination system, novel methods are needed to control these two pest issues. Washington State University (WSU) bee research team has already made strides in developing innovations to address these two issues, including the breeding of a new strain of entomopathogenic fungus against Varroa mites and the identification of the first candidate treatments for honey bee viruses. This grant will be used by WSU to 1) continue to breed our novel strain of *Metarhizium* fungus for improvement as a biological control agent against Varroa mites; 2) determine the best dosages and delivery methods of *Metarhizium* for Varroa control; 3) test new formulations and IPM practices using extracts from wood decay fungi to treat bee viruses; 4) partner with industry to produce the first ever available treatment for honey bee viruses.

Grant Recipient: WSU – Tobin Peever
Project Title: Novel Disease Control Strategies for WA Berry Growers
Award: \$207,709

Abstract: Washington State University and the Agricultural Development Group are proposing a research project that will provide Washington (WA) berry growers with novel and environmentally sound control measures for WA berry diseases. WA berry growers suffer severe annual fruit losses due to Botrytis gray mold, the most economically significant disease facing the industry. Our research over the past four years, funded by a previous WA-SCBG, uncovered widespread resistance to four of five fungicides (Pristine, Switch, Elevate and Rovral) used in WA berry production. Growers are in desperate need of strategies to preserve existing fungicides and slow resistance development and require access to new disease control products with different modes of action. The WA Red Raspberry Commission and Blueberry Commission consider Botrytis fungicide resistance a top research priority. Many of the same fungicides used to control gray mold of raspberry, blueberry and strawberry are also used to control other diseases of berries. Berries are often grown side-by-side in WA, have common fungal pathogens that move between crops, and have similar problems with fungicide resistance. Improved grower access to timely fungicide resistance information as well as access to new fungicides with novel modes of action are desperately needed. This project will address three interrelated objectives that build on previous research: 1) high-throughput monitoring of fungicide resistance in individual berry fields, 2) high-throughput monitoring of SDH resistance mutations to new FRAC7 fungicides in individual fields, 3) evaluation of alternate fungicide timing strategies, and 4) efficacy testing of new fungicides with novel mode of action.

Grant Recipient: Washington Asparagus Commission
Project Title: Developing a Washington Organic Asparagus Industry
Award: \$82,932

Abstract: The Washington Asparagus Commission is submitting a proposal to the Washington SCBG program to help develop an organic asparagus industry. Current production is limited due to difficulty in controlling the European asparagus aphid and a spectrum of weed species. There is tremendous demand for organic asparagus and growers want to transition conventional asparagus to organic asparagus and are in need for technical assistance. The objectives of this trial are to develop new and improved means of control for European asparagus aphid (EAA) and weeds using new tactics approved for organic use in asparagus.

There are relatively new organically approved insecticides that have never been screened against European asparagus aphid. Some of these products have been found effective against other aphid species, but have not been screened against EAA. There is a new selective organic herbicide that is expected to be registered in 2018. This herbicide and other organically approved herbicides can be used in organic asparagus under certain conditions. New vision system guided cultivators have been developed that are thought to have the ability to discern between asparagus spears and stems and weeds. This technology has not been used in an asparagus fields.

It is expected that by the projects conclusion that organic asparagus growers will be able to achieve control of EAA at a level comparable to that of conventional growers and will have a substantially effective set of tools to control weeds in asparagus.

Grant Recipient: WSDA – Organic Program
Project Title: Expanding Organic Access: Creating Resources for Spanish-Speaking Tree Fruit Growers
Award: \$108,040

Abstract: The WSDA Organic Program translation project will provide access and resources related to

organic certification for Spanish-speaking operators, managers, and farmworkers in the tree fruit industry. Spanish speakers are crucial participants in the success of agriculture in Washington State, and tree fruit in particular. While agricultural safety programs and pesticide applicator trainings have been implemented to support Spanish speakers, little is available to support the Spanish-speaking population in organic agriculture. To address this critical need, WSDA Organic Program will format and translate its application, technical factsheets, and resources into Spanish. Further, the Organic Program will work with industry partners to clarify and distribute these resources, ensuring Spanish speakers have equitable access to organic certification technical assistance.

This three-year project will include:

Review and translation of WSDA Organic Program application, technical factsheets, and resources into Spanish

Format and publication of documents for print and web

Development of outreach tools for tree fruit growers, industry leaders and supporters, and technical assistance providers

Hosting of workshops and events to ensure the accessibility and clarity of these resources by developing these resources, WSDA Organic Program will:

Give Spanish-speaking conventional tree fruit growers access to a premium price for their product through transition to organic

Improve understanding of the USDA organic regulations

Assist orchard owners in educating workers regarding organic regulations and compliance

Provide resources for the Spanish-speaking agricultural support industry to better understand and provide guidance to growers wishing to transition to organic

Encourage the development of additional Spanish resources for tree fruit growers

Grant Recipient: Sustainable Connections

Project Title: Growing Wholesale Prospects for Whatcom and Skagit Specialty Crop Producers

Award: \$151,273

Abstract: Unsold produce is a major problem for smaller producers—any crop that goes unsold directly represents a loss of potential revenue. Despite this, 42% of producers surveyed by Sustainable Connections currently have “a lot” of product that they are unable to find buyers for. Most of these producers identify wholesale buyers as their best opportunity to sell their remaining product but 61% report that they struggle to successfully manage wholesale contracts.

Growing from direct to consumer sales to working with multiple wholesale buyers is a daunting step for many specialty crop producers. Working with wholesale buyers requires different relationship building techniques and a wide array of new technical knowledge and skills that are not required for direct to consumer sales. Over the course of this project, Sustainable Connections will work with more than 100 specialty crop producers throughout Whatcom and Skagit counties to help them develop the know-how to be comfortable successfully managing relationships with an array of different buyer types (restaurant, grocer, and institution). We will facilitate introductions between buyers and producers; provide technical training on larger scale crop growth, packaging, and marketing; and facilitate specialty crop and wholesale buyer collective crop planning efforts to help specialty crop producers maximize profit potential.

At the end of our project over a hundred Whatcom and Skagit County, specialty crop producers will be better positioned to engage in larger scale sales to wholesale buyers and will transform production capacity that currently goes unsold into an additional \$500,000 annually in revenue for those producers.

Grant Recipient: Neighborhood Farmers Market Alliance

Project Title: Increasing Sales for Direct Market Specialty Crops through Digital Marketing

Award: \$107,858

Abstract: The Neighborhood Farmers Market (NFM) is a nonprofit 501c3 system of seven highly regarded farm and food-only markets in diverse Seattle neighborhoods, serving over 600,000 shoppers per year, with gross sales to farmers totaling \$7,707,862 in 2017. Specialty crop sales totaled \$5,447,935 or about 70% of farm sales. This project will allow the NFM to continue to further implement and share best practices for Farmers Markets and Farmers in the digital/social media era.

The goal of the project is to increase specialty crop sales through consistent, high quality digital media marketing especially during high harvest season (May-October), which will target new shoppers. A 5% increase in farm sales in the NFM system adds almost \$400,000 in annual sales to Washington's small farmers, \$250,000 of which is specialty crop sales.

The project will include: high season staffing dedicated to social media content creation, posting, engagement, ad buys (and A/B testing), leveraging influencers, back-end evaluation, and training for staff and farmers. Seattle's consumers are tech-savvy, social media hungry, and there is a massive millennial workforce that will be inspired to shop and learn through well executed digital media planning.

Building on a consultant's work plan provided in a previous grant, this project will allow the NFM to launch a digital media campaign building on an already large audience in order to translate likes and shares into specialty crop farm sales.

Grant Recipient: WSU – Kirti Rajagopalan

Project Title: Decision Support for Managing Climate Risks in Tree-Fruit and Grapes

Award: \$249,971

Abstract: We are an interdisciplinary team from Washington State University (WSU) with expertise and prior experience in biophysical modeling, field experiments, development of decision support systems (DSS), and extension and stakeholder engagement for tree fruit and grape production. We propose to develop a DSS that provides climate-related risk analysis and risk management decision support for the tree fruit and grape industries. To ensure that the DSS provides practical information that is useful and usable, it will be developed in collaboration with a stakeholder advisory group comprising industry representatives. This proposal addresses three critical temperature-driven production risks: (i) sunburn risk in tree fruit, (ii) shifts in apple bloom time, honeybee foraging behavior, and the potential for plant-pollinator interactions to be out-of-sync, and (iii) cold-damage risk in grapevine. We build on tested models based on field experiments/observations, and leverage existing web-programming infrastructure. We also piggyback information delivery on trusted existing DSS currently used by our target audiences to increase the likelihood of adoption and use. The DSS will allow tree fruit and grape producers/consultants in Washington State to (a) understand and analyze current and emerging climate related production risks, (b) evaluate options for managing risk, (c) be better prepared to address emerging increased vulnerability to risks and (d) incorporate risk management in their long-term planning. While the proposal addresses multiple funding priorities, it is most closely related to "improving production practices through innovative technologies" through its focus on development of decision-support technologies.

Grant Recipient: WSU – Lisa DeVetter

Project Title: Improving Machine Harvest Efficiency and Fruit Quality for Fresh Market Blueberry

Award: \$178,328

Abstract: Fresh-market blueberry growers in Washington and Oregon are increasingly constrained by high labor costs and decreasing availability, which directly impacts harvest operations and farmers' profitability. Growers need new solutions to grow and efficiently harvest a safe and high-quality product while maintaining economic solvency. This proposal jointly submitted by Washington State University and Oregon State University seeks to address this need while building on the promising work of this research team's previous research with mechanical harvesters. In this two-year multi-state project, we propose to: 1) Develop and test harvest technologies and practices that allow for the mechanical harvest of fresh market blueberry with high

fruit quality and high harvest efficiency; 2) Evaluate packing lines for impact forces that could decrease fruit quality; 3) Compare food safety risks associated with traditional and new harvesting technologies; 4) Assess microbial quality of the fruits harvested by hand versus using mechanical harvesters; and 5) Extend project information to growers and packers in Washington and Oregon. Completion of this project will produce new knowledge, practices, and tools that will enable the efficient harvest and packing of high quality fresh market blueberries and minimize risks associated with food safety, which will reduce growers' dependence on hand labor for harvesting and promote cost- savings.

Grant Recipient: WSU – Manoj Karkee

Project Title: Precise Mechanical Solution for Vineyard Shoot Thinning

Award: \$195,232

Abstract: This proposal is submitted by Washington State University. We propose to develop an automated solution for green shoot thinning in wine grapes. Currently, there is about 55,000 acres of wine grapes and about 900 licensed wineries in Washington with ~\$5 billion economic impact to the state. Green shoot thinning, an operation to remove some of the shoots from vine cordons, is used to improve spacing and direction of shoot growth, which is essential to create healthy and productive canopies as it improves light penetration and air movement in the canopies. This operation is highly labor-intensive, costing growers >\$265/acre/year. Machine thinning can reduce the cost to about ~\$10/acre. However, currently available shoot thinners lack desired level of precision and speed, and require skilled operators. Our goal is to develop an automated system for precise positioning of thinning heads of a mechanical thinner. To achieve this goal, we will focus on developing; i) a machine vision system to estimate cordon/trunk location and shoot density; ii) a prototype, pneumatic shoot thinner capable of quickly adjusting thinning roller position for precise removal of target shoots; and iii) an integrated, automated thinning machine and evaluate it in the vineyard environment. By the end of the project, it is expected that our prototype and field validation study will provide sufficient data and information for companies to develop and commercialize the machine. Commercial adoption of this technology will reduce farm labor use and production cost, resulting in a substantial benefit to Washington wine grape industry.

Grant Recipient: WSU – Kiwamu Tanaka

Project Title: High-Throughput Technology for Molecular Detection of Potato Pathogens

Award: \$249,414

Abstract: Potato production is impacted by many pathogens and nematodes that reduce yield, quality, and marketability of the harvested crop. To limit the prevalence of disease, diagnostic tests are implemented in both seed certification schemes and as pre-plant assessments of potato field soils. However, these individual tests are cumbersome and expensive, and often the less expensive tests are also less effective especially when testing tuber tissue. Our goal is to develop a high-throughput method for the molecular detection of all potato pathogens, including those that are soil-borne, seed-borne, and insect-spread. The “Millichip” is a microarray technology with a low cost that is convenient for a typical bench scientist to use on a day-to-day basis. If we can successfully implement this new technology for potato diseases, the sustainability and profitability of the Washington state potato industry will benefit from improved diagnostics and disease control strategies, and more secure trade agreements. To accomplish this goal, we will pursue the following objectives: (1) design nucleotide probes that detect potato pathogens on the Millichips; (2) test run designed Millichip array using DNA template, tuber, or soil samples; (3) improve and refurbish Millichips based on the test run results; (4) disseminate Millichip technology and provide workshops for the WA potato community. This project will be mainly conducted by the Molecular Plant Pathology Lab at Washington State University in Pullman, WA.

Grant Recipient: WSDA – Organic Program

Project Title: Enhancing the Competitiveness of Certified Organic Specialty Crops at Farmers Markets

Award: \$99,600

Abstract: This project will enhance the competitiveness of specialty crops that are certified organic by

ensuring that the USDA organic label is understood and valued by consumers in Washington State farmers markets. Over 20% of crop producers that are certified organic by WSDA report selling a wide variety of tree fruit, berries, and other fruit, alongside vegetables, from asparagus to zucchini, at farmers markets. In partnership with 25 farmers markets and statewide industry leaders, the WSDA Organic Program will provide timely and targeted training on organic certification standards, clarify signage requirements and market policies, and share best practices on organic income records at farmers markets. A new “Fresh Produce Labeling and Signage Standards for Farmers Markets” workbook will provide an accessible understanding of consumer protections, regulations, and best practices to 100 markets’ staff, volunteers and vendors. This two-year project will directly benefit 75 specialty crop producers through improved organic visibility at their farmers markets, practical income record keeping tools, and proactive messaging to convey to shoppers and during statewide promotions such as Washington Organic Week. More generally, this project will promote specialty crops that are certified organic by building consumer trust and transparency in produce claims while reducing consumer confusion and potential fraud. The positive ripple effect among farmer’s market shoppers, specialty crop farmers, and among additional farmers markets will create a lasting impact.

Grant Recipient: WSU – Meijun Zhu

Project Title: E. Faecium as a Surrogate for L. Monocytogenes Intervention in Apple Dunk Tank Systems

Award: \$249,344

Abstract: Apples are important specialty crops in Washington State. The listeriosis outbreak in caramel apples highlights the microbial safety of apples. The dump tank water system is the first and essential step of fresh apple process, where water is re-used over several processing days. This practice increases possibility of cross-contamination of foodborne pathogens including L. monocytogenes during apple processing. The FSMA Rules require apple packers to develop specific efficacy data for their process controls; however, information about the practical efficacy of sanitizers used in the dump tank is missing, neither is there an effective method to validate dump tank intervention, leaving critical knowledge gaps. A reliable non-pathogenic surrogate is urgently needed to predict behaviors of L. monocytogenes in dump tank practice. The overall goal of proposed studies is to comprehensively examine and validate Enterococcus faecium as a surrogate for L. monocytogenes intervention in the dump tank water system. Washington State University will pursue two objectives: 1) Evaluate use of E. faecium as a surrogate for L. monocytogenes antimicrobial intervention in dump tank and flume water system with different levels of organic matter; 2) Compare cross-contamination rates of E. faecium and L. monocytogenes in water-to-apple, apple-to- water, and apple-to-apple during dump tank practices of fresh apple packing lines. The proposed project will identify a validated non-pathogenic surrogate to predict L. monocytogenes behavior during intervention in dump tank water system. Knowledge developed will be disseminated to the apple packers and handlers in Washington as well as other regions.

Grant Recipient: WSU – Faith Critzer

Project Title: Evaluation of Agriculture Water Disinfection Treatments

Award: \$194,017

Abstract: Dr. Faith Critzer, Associate Professor at Washington State University, has been actively engaged in discussions with the growing community regarding implementation of the Produce Safety Rule (PSR; 21 CFR Part 112). The PSR has begun to shape the production practices of fruit and vegetable growers across Washington. Because pre-harvest agricultural water has been identified as a likely point of foodborne pathogen contamination during fruit and vegetable production, the PSR calls for rigorous water testing of generic E. coli populations in order to verify the microbial quality of surface water that will contact the edible portion of the plant during growing, unless a water treatment method is used. The testing expenses will greatly impact Washington fruit and vegetable growers since many utilize surface water for irrigation, cooling or foliar sprays.

Produce growers are continually evaluating new practices to mitigate food safety risks in their operations. Both chemical (peroxyacetic acid and chlorine) as well as antimicrobial devices (UV-lights) are increasingly assessed by growers as they are considered for potential agricultural water treatment strategies. However, there are several knowledge gaps currently acting as barriers, including science-based data to document efficacy of these treatments in typical production conditions and cost analysis which can be utilized in growing budgets to help drive decisions when growers seek the most economical and effective options. Outcomes from this project would increase the number of growers knowledgeable in treating agricultural water, allowing them to make educated decisions on the efficacy of in-line water treatment as a risk mitigation strategy.

Grant Recipient: WSU – Bernardita Sallato-Carmona

Project Title: Root Growth Management to Reduce Ca Deficiency Disorders in Apples and Cherries

Award: \$152,937

Abstract: Calcium (Ca) deficiencies can lead to several disorders that reduce fruit quality and storability in Washington's key tree fruit crops. Bitter pit (BP) in apples has an estimated loss of 5% to 10% each year. Honeycrisp, the most planted cultivar between 2011 and 2017 in Washington, is highly susceptible with up to 50% losses each year. In cherries, Ca deficiencies are responsible for reduced fruit quality, most importantly fruit cracking and firmness, both critical perennial issues. In an effort to overcome Ca deficiency disorders growers in the PNW spray between 6 to 20 times throughout the season with various Ca-containing supplements, yet typically with unsatisfactory results. At Washington State University, we propose to reduce Ca-deficiency disorders by promoting early root growth. A correlation between root zone conditions; temperature, nutrients, pH and water availability, and Ca-deficiency disorders will be evaluated in different WA apple and cherry orchards. In parallel, we will evaluate the effect of soil temperature, root pruning and soil nutrient supply on early root growth and fruit quality. To develop a better indicator of Ca-deficiency disorders, we will compare the predictability of Ca-pectate analyzes versus total Ca. With this novel project, we expect to obtain a better understanding of Ca absorption and distribution, and to reduce Ca-deficiency disorders contributing to the competitiveness of the PNW apple and cherry industries. The outcomes will develop management practices to promote early root growth and thus, Ca-absorption during cell division, immediately transferable by the end of the project through outreach activities and education.

Grant Recipient: WSU – Beverly Gerdeman

Project Title: Investigating Impacts of Insecticides on Pollinators in a Biennial Seed Crop

Award: \$72,012

Abstract: This Washington State University research will provide growers with guidance to maximize bee safety while controlling common pests of cabbage seed crops when using a fall neonicotinoid drench for cabbage maggot and a foliar pyrethroid for common seed pests such as lygus. This data will provide critical information for producers of bee pollinated brassica seedcrops. Objectives: Investigate potential of late season systemic insecticide drenches for control of cabbage maggot, to contaminate nectar and pollen and impact pollinators in cabbage seed, a biennial specialty crop. Evaluate honey bee contact toxicity of field-aged residues of a popular pyrethroid, bifenthrin, applied in the spring for pre/post-bloom control of common cabbage seed pests. Late season applications to control cabbage maggot; thiamethoxam and clothianidin will be applied in early October to cabbage grown for seed along with an untreated check. In the spring, 2 rates of bifenthrin will be applied for control of cabbage seed pests, including lygus, to test residual contact activity on honey bees. Determining decline rate for the high and low field rates of bifenthrin will provide more precise knowledge of the period of toxicity and safe bee re-entry. Tissue and/or nectar analyses for fall drenches and residue decline studies from the spring foliar pyrethroid treatment will be conducted by Synergistic laboratories. Honey bee bioassays will also be conducted (according to EPA Honey Bee Toxicity

of Residues on Foliage, OCSPP 850.3030).

Grant Recipient: The Center for Produce Safety

Project Title: Fate of Different *Listeria monocytogenes* Strains on Different Whole Apple Varieties during Long-Term Simulated Commercial Storage

Award: \$228,260

Abstract: The Center for Produce Safety will partner with Michigan State University to determine the fate of *Listeria monocytogenes* on three varieties of whole apples during long-term simulated commercial storage. The microbiological safety of whole and sliced apples has been called into question during the last seven years due to multiple recalls for *Listeria monocytogenes* (Lm) and a high-profile outbreak of listeriosis from caramel apples. Most recently, whole Gala and Honeycrisp apples were recalled in December 2017 due to Lm contamination, suggesting extended survival of this pathogen. This project aims to answer specific research questions for the apple industry: (i) Do different foodborne outbreak strains of Lm differ in their ability to survive on apples; (ii) Does Lm survival differ when apples are contaminated from water versus direct contact with equipment surfaces (crates, brushes); (iii) Does the physiological state of Lm, specifically whether cells in the inoculum harvested from a planktonic (i.e., broth) culture versus from a biofilm (i.e., solid surface) impact Lm's subsequent fate on the apples; (iv) Does storing apples in air versus a controlled atmosphere (low oxygen and low carbon dioxide) affect Lm survival; (v) Does the variety of apple (Gala, Granny Smith, Honeycrisp), region in which the apples are grown (Washington State, Michigan, Pennsylvania), and growing season affect how Lm attaches and survives on apples; and (vi) Does apple waxing affect Lm survival? Answers to these and other questions will assist the apple industry in minimizing the Lm risks associated with current apple growing and packing practices.

Grant Recipient: USDA-ARS – Theresa Pitts-Singer

Project Title: Using Native Blue Orchard Bee for Pear and Sweet Cherry Orchard Pollination

Award: \$153,893

Abstract: The USDA-ARS Pollinating Insects Research Unit in Logan, Utah, is seeking funding with WSU-IAREC in Prosser, WA to evaluate the feasibility of *Osmia lignaria* (the blue orchard bee; 'BOB') pollination of Washington commercial pear and sweet cherry orchards. BOBs are well suited to provide pollination to Pacific Northwest orchards due to their high fidelity to spring-blooming orchard crops, and their propensity to forage in cool, wet weather. Provided recent declines in honey bee colony abundance and health, BOBs may serve as effective alternative pollinators for commercial orchards, and especially for orchards relying on cross pollination to set fruit (such as pears and sweet cherries). This project evaluates the contribution of BOB co-pollination with honey bees to pear and sweet cherry yields in orchards that have been historically limited by poor pollination. We will follow BOB reproduction and fruit yield in commercial Washington orchards for three consecutive years. Fruit yield per acre will be evaluated annually and compared to historical yield averages to examine the relative impact of BOB pollination on orchard performance. Yield averages will also be compared to fruit production of neighboring orchards that did not receive the added benefit of BOB pollination. If experimental orchards reveal consistent increases in fruit yield over time and relative to other neighboring orchards in a given year, it will confirm that BOB pollination provides an overall net benefit to Washington fruit growers. This study would be the first to report on the potential success and influence of BOB pollination on Washington orchards.

Grant Recipient: WSU – Girish Ganjyal

Project Title: Addressing the Technical Gaps to Increase the Markets for Dry Peas

Award: \$243,247

Abstract: This project, addresses critical needs that can directly help increase the markets for dry peas. Lack of basic physical, chemical, and functional data on individual varieties of dry peas as whole flours and their protein fractionates is a significant hurdle for their use in end products. Generating these basic data will expand the capability of product development companies to successfully utilize pea proteins and flours in their products, growing the market applicability of dry peas, particularly in contribution to novel extruded

meat analogues, if these data are made available to the industry. Thus, the objective of this project is to produce the basic processing data for all commercially available dry pea varieties grown in the state of Washington and, for comparison, the surrounding region. Further, data will be generated on the extrudability of these pea proteins for making texturized protein products. Importantly, all of the data generated will be publicly available and disseminated to relevant stakeholders through various channels including grower meetings, professional meetings, online resources and publications. To accomplish these goals, the following tasks will be completed at WSU laboratories: i) acquisition of all commercially available varieties of dry pea seeds through generous donation by project collaborators; ii) physical and chemical analysis of whole seed flours and protein fractionates; iii) determination of functionality of flours and proteins through extrusion processing; and iv) dissemination of data through the mechanisms mentioned above and measuring the impacts.

Grant Recipient: Washington Blueberry Commission

Project Title: Increasing Washington Blueberry Exports to India through Tariff Reductions

Award: \$205,500

Abstract: The Washington Blueberry Commission (WBC) is seeking funds to lower the current excessive Indian tariffs applied to blueberries to improve the export potential for Washington blueberry products into India. This effort would involve preparing an economic study to promote the benefit to the Indian economy from a blueberry tariff reduction, traveling to India to build a coalition of domestic groups to support a tariff reduction in the market, and formally petitioning for the tariff reduction through the Indian budget process. The ultimate objective is to support the Washington blueberry industry and its growers through enhanced access to one of the largest, and most rapidly growing markets in the world.